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Formula Hybrid at VCU: Epicyclic Power Distribution System

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Award Winners

MECHANICAL AND NUCLEAR



Formula Hybrid at VCU

Epicyclic Power Distribution System

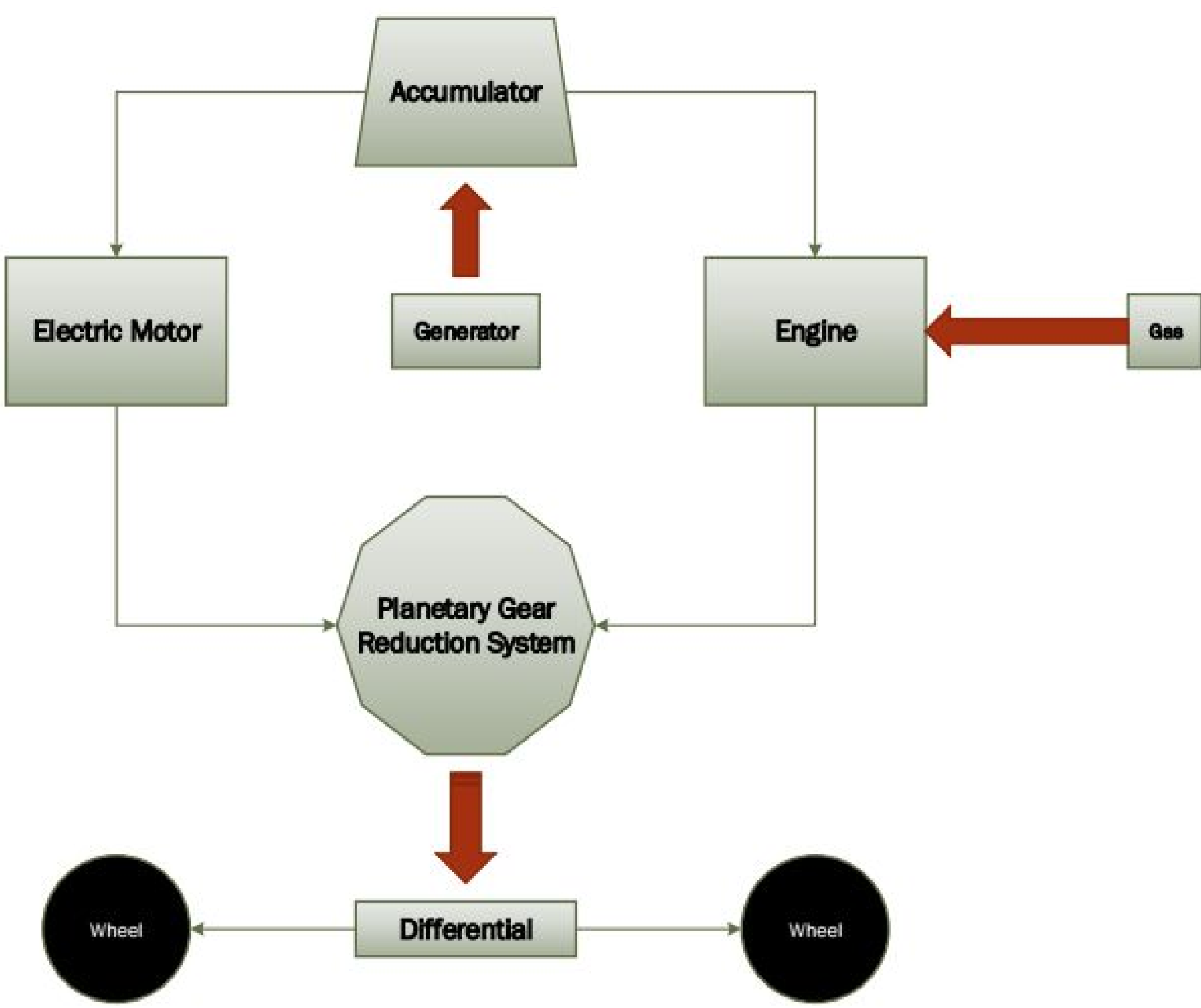


Purpose & System Flow

What is an Epicyclic Power Distribution System?

A system which combines two independent power inputs from both an electric motor and an internal combustion engine.

- ❑ Designed for the Formula Hybrid race car at VCU
- ❑ First and only Formula Hybrid team in Virginia
- ❑ Opportunities for future cross-discipline integration
- ❑ Focus on reduction of vehicle emissions



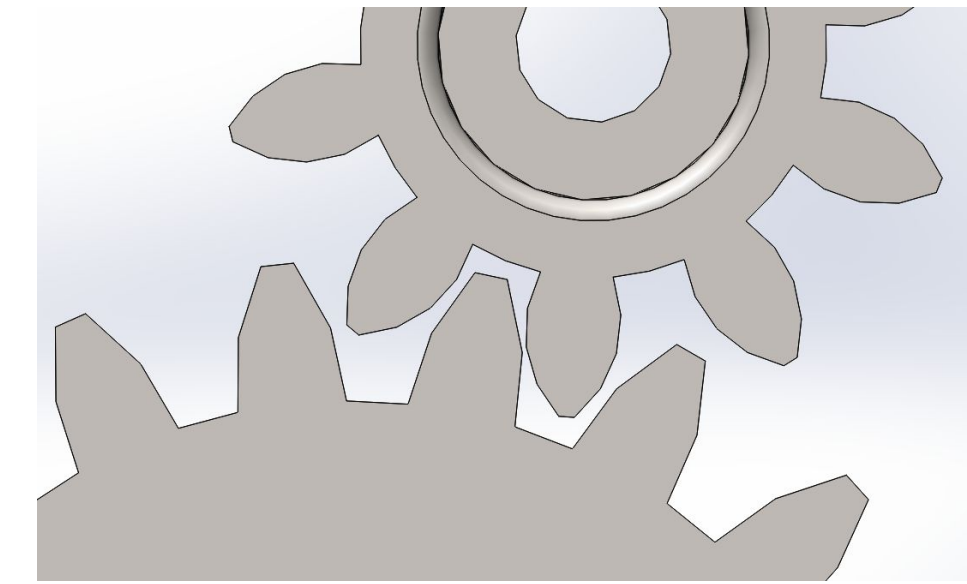
Torque and Power Inputs

- ❑ Lynch LEM170-96 Electric motor
- ❑ Yamaha YZ250F | 250cc Motorcycle engine
- ❑ Both motors operate independently & simultaneously, as well as increase the efficiency of the engine in both hybrid and all-electric modes

Design

Gears

- ❑ Involute Profile
- ❑ Low Friction
- ❑ Easy to manufacture
- ❑ Constant pressure angle
- ❑ High strength steel alloy



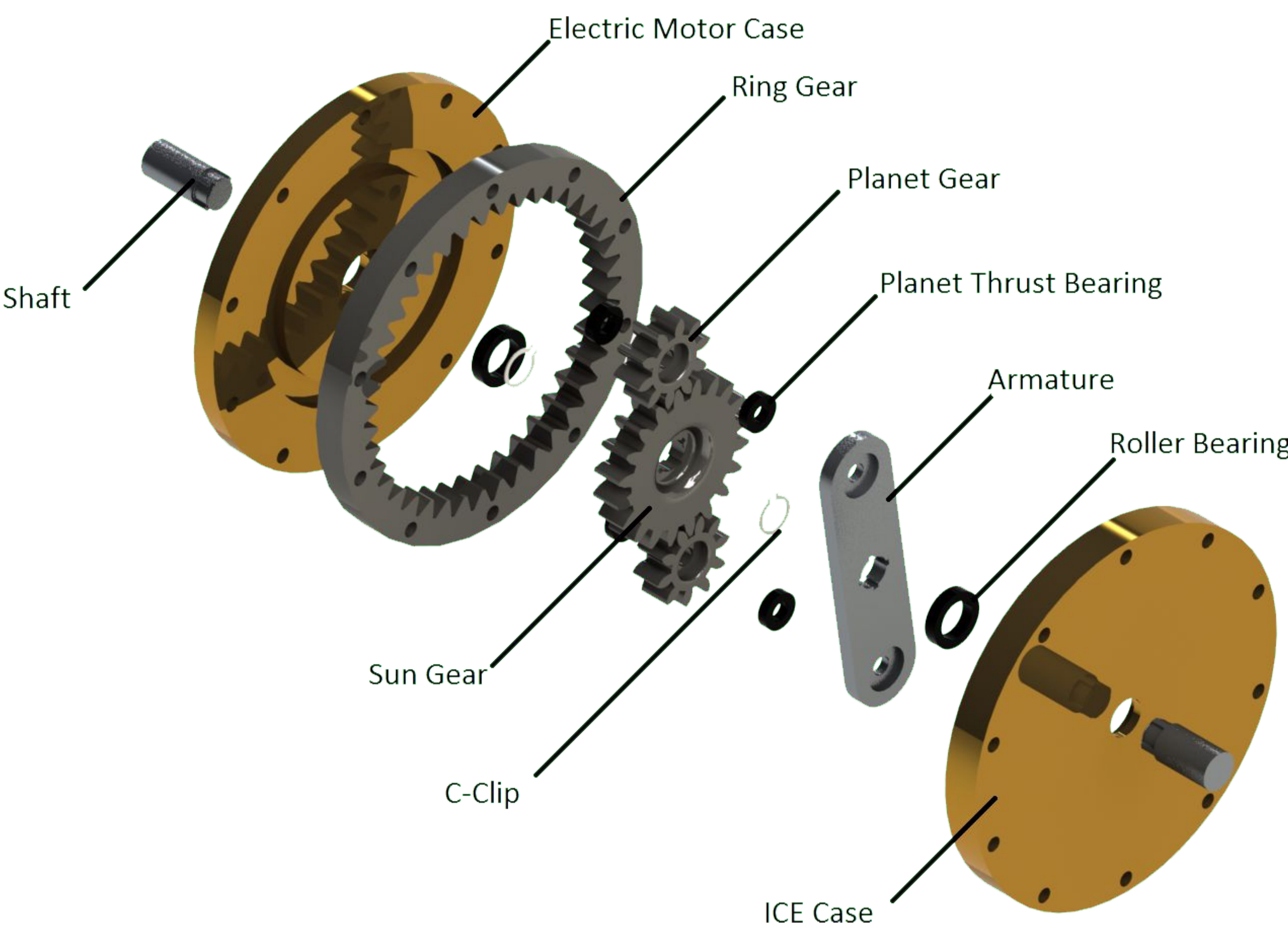
Bearings

- ❑ Thrust Bearings
- ❑ Roller Bearings

Planet Thrust Bearing



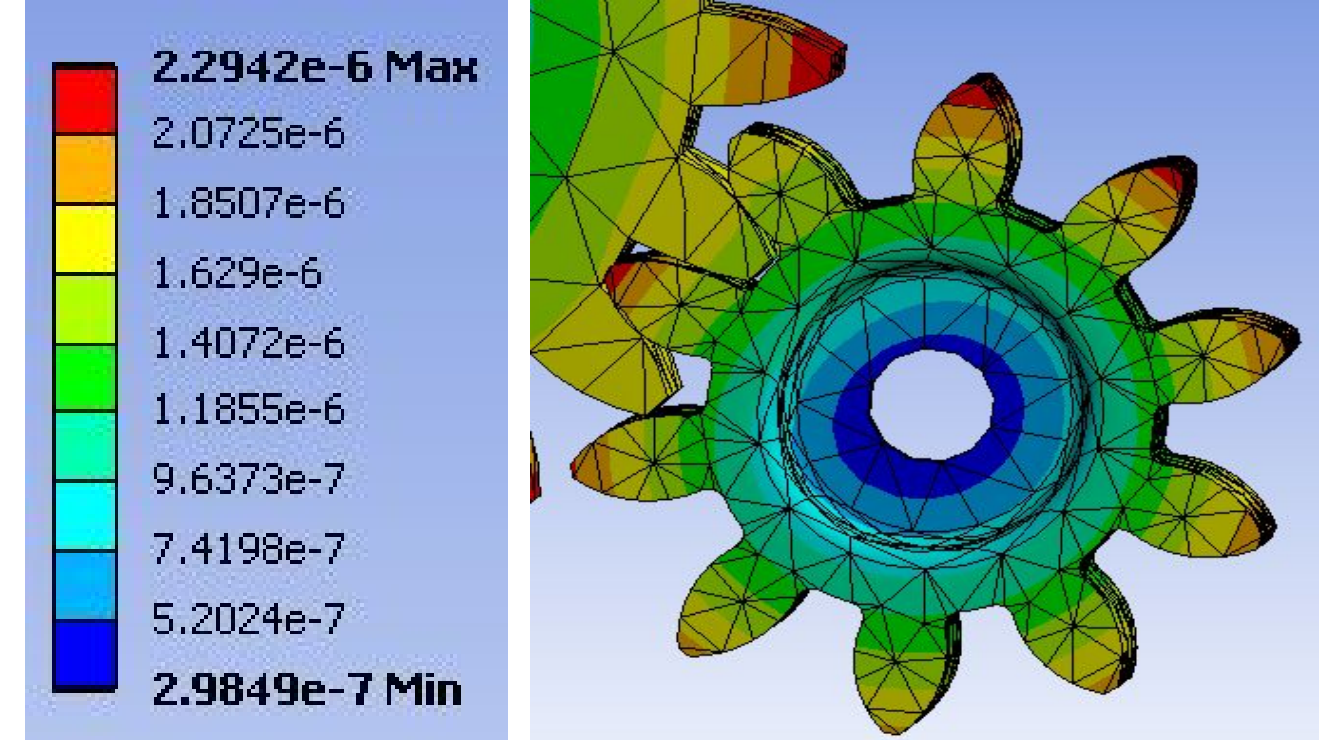
Roller Bearing



Analysis

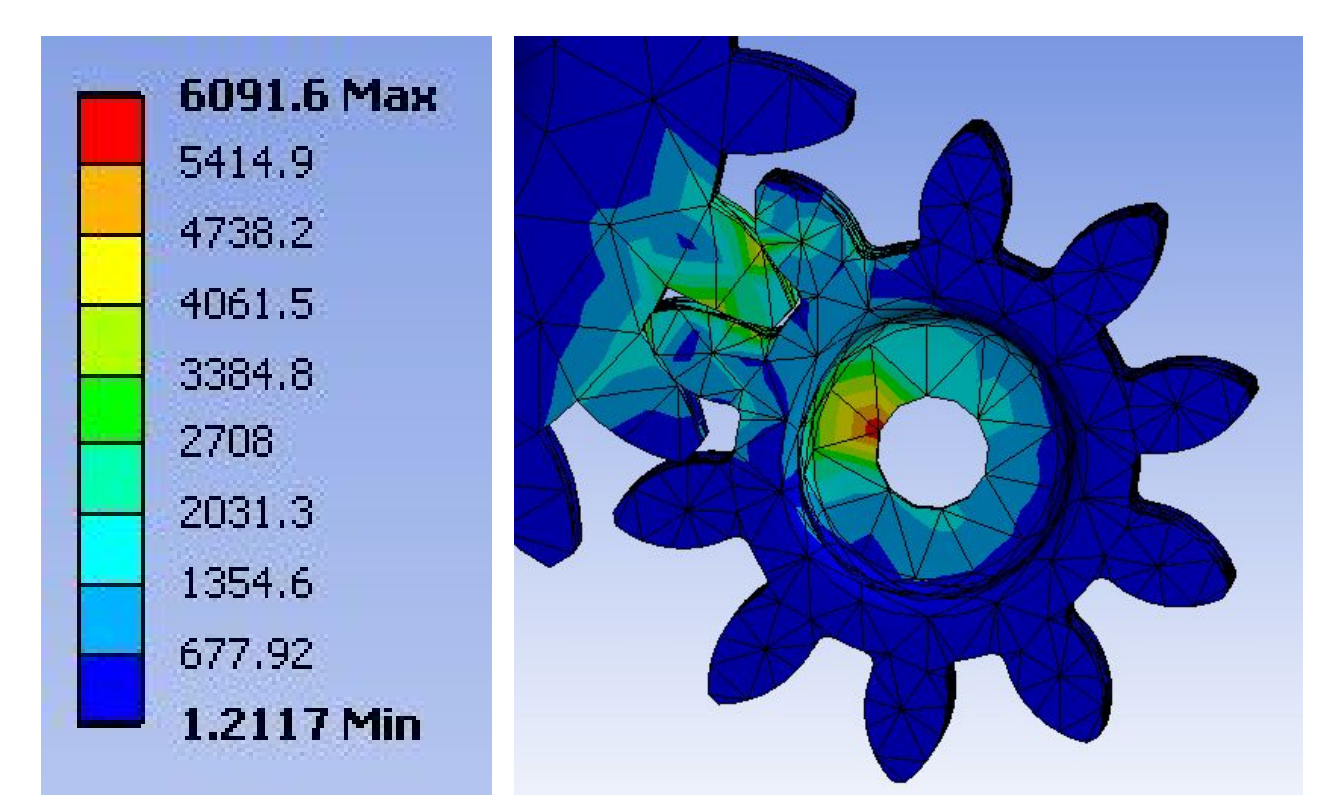
Total Deformation

(Units in mm)



Equivalent (Von-Mises) Stress

(Units in Pascals)



Operating torque from electric motor: 12 N-m

- ❑ Total deformation and stress of input and output gears are well within operational limits

Future Considerations

Future Formula Hybrid teams will need to consider:

- ❑ Clutch System
- ❑ Engine Management
- ❑ Chassis Improvements
- ❑ Manufacturability
- ❑ Procurement